

Phosphorous Cycle

Phosphorus in earth systems is usually in the form of phosphate (PO_4^{3-}). In living organisms it is an essential constituent of cell membranes, nucleic acids and ATP (the carrier of energy for all life forms). It is also a component of bone and teeth in humans and animals. The phosphorus cycle is relatively simple compared to the other cycles of matter as fewer reservoirs and processes are involved. Phosphorus is not a nominal constituent of the atmosphere, existing there only in dust particles.

Most phosphorus occurs in crustal rocks or in ocean sediments. When phosphate-bearing rock is weathered, the phosphate is dissolved and ends up in rivers, lakes and soils. Plants take up phosphate from the soil, while animals ingest phosphorus by eating plants or plant-eating animals. Phosphate is returned to the soil via the decomposition of animal waste or plant and animal materials. This cycle repeats itself again and again. Some phosphorus is washed to the oceans where it eventually finds its way into the ocean-floor sediments.

The sediments become buried and form phosphate-bearing sedimentary rocks. When this rock is uplifted, exposed and weathered, the phosphate is again released for use by living organisms.

The movement of phosphorus from rock to living organisms is normally a very slow process, but some human activities speed up the process. Phosphate-bearing rock is often mined for use in the manufacture of fertilizers and detergents. This commercial production greatly accelerates the phosphorous cycle. In addition, runoff from agricultural land and the release of sewage into water systems can cause a local overload of phosphate. The increased availability of phosphate can cause overgrowth of algae. This reduces the oxygen level, causing eutrophication and the destruction of other aquatic species. Marine birds play a unique role in the phosphorous cycle. These birds take up phosphorous from ocean fish. Their droppings on land (guano) contain high levels of phosphorous and are sometimes mined for commercial use.